VETERINARY POST-MORTEM EXAMINATIONS

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VETERINARY

POST-MORTEM

EXAMINATIONS

BY

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PREFACE.

Records of autopsies, to be of any value, should accurately represent the appearances of the tissues and organs so that a diagnosis might be made by the reader were not the examiner's conclusions stated. To make the pathological conditions clear to the reader, some definite system of dissection is necessary. The absence in the English language, of any guide in making autopsies upon the lower animals, induced the writer to contribute an article upon this subject to the "Reference Handbook of the Medical Sciences." Volume VII. 1888. That it may be of more practical value to the profession I have decided to publish it in book form.

A. W. C.

VETERINARY POST-MORTEM EXAMINATIONS.

The general method of making post-mortem examinations on animals is similar to that followed in human autopsies. Yet the differences in the size of the organs, together with some differences in the anatomy, make certain special procedures necessary.

The supero-inferior greatly exceeds the lateral diameter of the chest in all four-footed animals. The supraspinous processes are greatly developed and the muscles which attach the limbs to the trunk are short and thick, bringing the scapula and humerus close to the chest and the femur close to the posterior part of the abdomen (see Fig. 1.) The shape of the thorax, therefore, together with the way in which the legs are attached to the body, make it impossible to keep the animal upon its back without

some support, or without loosening the muscular attachments; and, in the larger animals, even the loosening of these muscular attachments will not keep the body perfectly well balanced.

In the smaller animals division of the pectoral muscles, allowing the fore limbs to lie flat upon the table, and of the adductors of the thigh, allowing the hind limbs to fall outward, will be found sufficient to keep the body flat upon its back (see Fig. 2).

For the larger animals, however, especial arrangements have been devised for holding them in place, and, though too elaborate for field-work, they can be made practicable in the city, where many dead animals are taken to one place. The methods here described will be based upon the supposition that the operator has appropriate arrangements at his disposal, and such substitutions as are necessary for ordinary field-work will be mentioned afterward. The horse will be taken as the type, and, unless otherwise mentioned, the description refers to that animal. Especial attention should be given to determining the presence of Entozoa as they are apt to be overlooked and often give rise to serious trouble and may cause death.

THE HORSE.—It is always better to have an animal on its back than on its side. It is also better to have the body on a platform so high that the opera-

tor can work conveniently. It is, moreover, desirable to have the platform movable, so that the position of the body may be changed at will.

For the above purpose a carriage or truck, similar to that used by railroad porters, may be made (see Fig. 3). This truck should be about eight feet long by three feet wide; the platform should be about two feet from the ground, and above the top of the four wheels which must support it. Iron sockets should be placed near the edge of the platform, and sunk into the wood so that the top will come even with the floor of the platform. These sockets must be so placed that they will come opposite each of the four limbs. They should be of just the right size to allow the uprights to fit into them. These uprights should be iron bars about four feet long and one inch thick. They should have a shepherd's crook on the end, to which the cords which hold the legs in place may be secured. These bars should fit loosely into the sockets, so that they can be removed easily at any time.

The animal can be hoisted on to the truck by means of a Yale pulley. When placed in position, the iron bars can be put in and the legs secured to them, as shown in Fig. 3. Everything is now ready. The animal is in position, the instruments are sharpened, and buckets of clean water and sponges are at

hand. The first procedure is to make a *general inspection* of the animal: 1, As to color; 2, sex; 3, age; 4, weight; 5, general condition; 6, condition of abdomen, whether much distended or not; 7, any abnormal appearances about the skin, such as scars, abrasions of the surface, evidence of having been blistered,

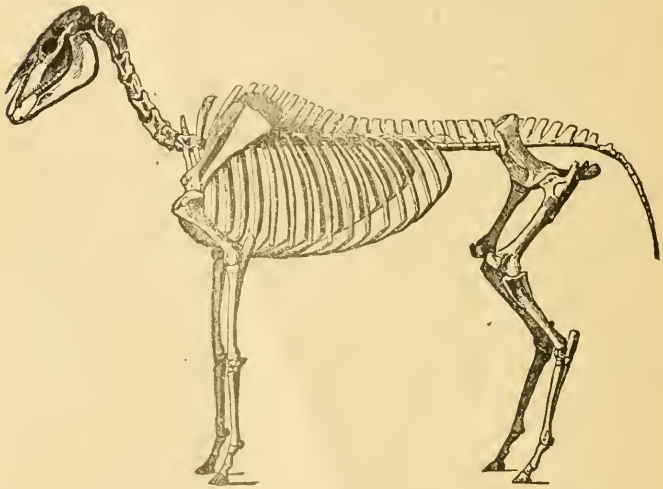

Fig. 1.—Skeleton of a Horse, showing the Shape of the Thoracic Cavity.

or of the actual cautery having been applied. Ectoza, Lice, Ova of diptera, Mange, Ectophyte, Ringworm; 8, any abnormal prominences or depressions; 9, condition of the hoofs; in short, any abnormal appearances striking enough to be evident to the eye on general inspection.

The general inspection having been completed, a *special inspection* of the exterior should now be made to determine: 1, The condition of the visible mucous membranes; 2, the condition of the glands in the submaxillary region, and in the parotid, axillary, and inguinal regions; 3, the condition of the skin over the jugular vein about midway of the neck (any cicatricial tissue giving evidence of the animal ever having been bled); 4, any prominences on the limbs —in short, any pathological conditions which can be made out by the eye or finger before any cutting has been done. The above inspection has generally to be made before the animal has been placed upon the truck, as the hide is saved by those who dispose of the animal.*

After this inspection an *incision through the skin* over the sternum is to be made. In human autopsies the knife, firmly grasped in the right hand, is drawn toward the operator's body, and the primary incision, begun at the chin, is carried to the pubis. In the lower animals, on account of the hair and dirt, such a procedure would take the edge off the knife; consequently it is better to adopt the method used by butchers, of making a small incision in the skin along the median line, then inserting the knife under the

*If the hide is saved, it is removed by the knacker or butcher before the animal is placed on the truck. It is an advantage to have the hide first removed.

skin, cutting upward through the skin, and away from, instead of towards one's self. *The incision must extend from the mouth to the anus*, passing to the right of the penis and testicles in the male and between the mammæ in the female. A second incision, begun just in front of the penis, should be carried to the anus, passing to the left of the penis. Incisions through the skin should be made transversely to this longitudinal incision from the middle of the pubis along the inside of the thighs nearly to the hocks, and from the middle of the sternum, along the inside of the forelegs, nearly to the carpus. The skin should then be cut around the legs at the end of the last incisions, and the skin taken off from this part of the legs, from the trunk and from over the trachea and lower jaw. Just beneath the skin are often found the larvae of diptera in various animals, especially in cattle. The penis should then be examined and dissected back, allowing it to fall over the perineum. The mammæ should be examined and excised if the animal be a female.

The *abdominal muscles* and the *peritoneum* may now be cut through from the sternum to the pubis, care being taken not to wound the intestines in the operation. About midway of the abdomen the muscles and peritoneum should be divided transversely, the cut extending to the false ribs on either side.

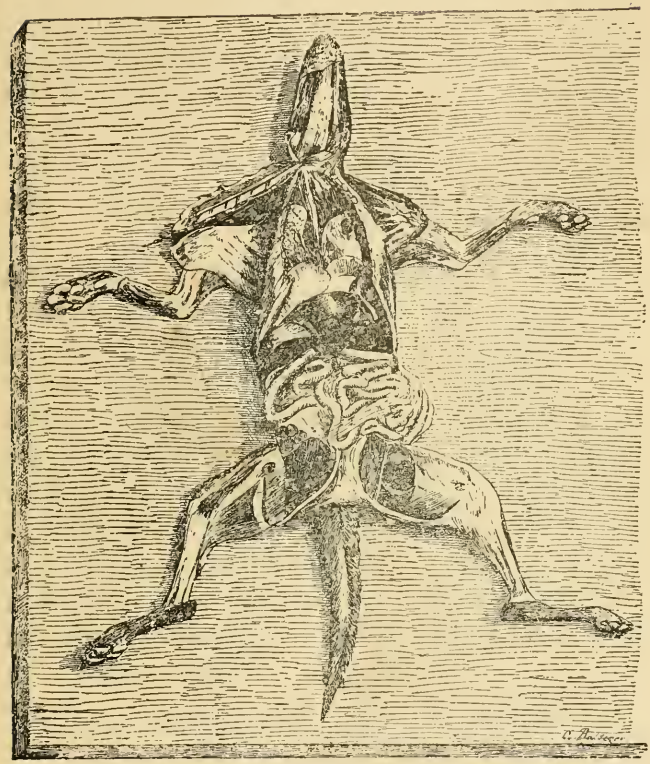

FIG. 2.—Post-mortem Examination on a Small Animal.

The flaps so made should be laid over on the chest and on the flanks, and cuts should be made in the muscle crosswise, so that the flaps will lie flat (see Fig. 3, *c*). While making the transverse section of the abdominal wall any abnormal contents of the peritoneal cavity should be noted, together with the character of such contents; also the condition of the peritoneum itself, and, in a general way, of the intestines.

In making autopsies on the human subject most precise directions are given to open the abdomen first, and to examine the contents without removing any organs; then to carefully ascertain the position of the diaphragm and to open the thorax and proceed with the dissection of the organs therein contained. On account of the bulkiness and intricacy of the intestines in the horse, it is well to remove them as soon as possible, else they will become involved in arrangement so as to make it difficult to straighten them out. It is therefore better first to dissect the large intestine, and the small intestine as far as the duodenum, in the horse, and in cattle to remove the stomachs as well; then to open the thorax and to remove the organs therein contained, and afterward to go back and finish the abdomen.

In the smaller animals, such as dogs, cats, pigs, etc., the intestines do not interfere, and the proced-

ure may be that followed in human post-mortem examinations, so far as the order of the removal of the organs is concerned (see Fig. 2).

We have now made a general inspection of the

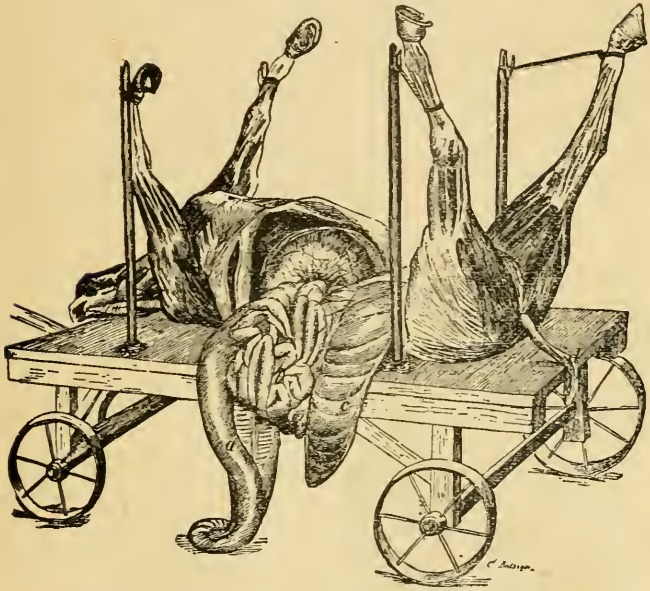

FIG. 3.—Truck for Post-mortem Examinations. *a*, Double colon; *b*, small intestine; *c*, cæcum.

animal, noted its color, sex, age, and weight, together with any abnormal appearances of the exterior. We have directed how the primary section should be made, and which part should be dissected first, and

why. The abdomen has been exposed and any abnormal contents have been noted, together with any abnormal condition of the peritoneum. We are now ready to begin the dissection of the intestines.

For convenience of description the abdominal cavity is divided into several areas; these divisions are arbitrary, and anatomists do not all agree as to how they should be made. The one most generally adopted in the schools in England and America, and which is probably the simplest, is the following, taken from McFadyean's "Anatomy of the Horse" (Edinburgh and London, 1884).

Two transverse planes divide the cavity into three regions, then two longitudinal planes subdivide each of these regions into three parts. The first transverse plane passes through the lower end of the fifteenth rib. The second passes through the external angle of the ilium on either side. The two parallel longitudinal planes extend from the pelvis to the sternum, passing through the centre of Poupart's ligament on either side. The regions thus formed are, between the diaphragm and the transverse plane passing through the fifteenth rib, the left hypochondriac, epigastric, and right hypochondriac; in the region between the above plane and the transverse plane which passes through the angle of the ilium, the left lumbar, umbilical, and right lumbar. The

regions posterior to the plane passing through the angles of the haunch are the left iliac, hypogastric, and right iliac.

The first part of the intestine to be manipulated is the *large or double colon.* It starts from the cæcum in the right hypochondriac region, passes forward to the diaphragm, where it turns upon itself, forming the suprasternal flexure. It then passes back to the pelvic cavity and there turns again, forming the pelvic flexure, whence it passes forward to the epigastrium, forming a third flexure—the diaphragmatic or gastrohepatic, which is in contact with the diaphragm and liver. It then passes back to the base of the cæcum, to which it is attached, and, becoming suddenly smaller, passes on as the floating colon. The first and fourth and the second and third portions are attached to each other at the sides; otherwise the gut is free from the time it leaves the cæcum until it terminates in the floating colon, at which point, as mentioned above, it is attached by cellular tissue to the base of the cæcum and to the pancreas.

It will be seen that the free extremity of the double colon is at the pelvic flexure. This extremity must be grasped firmly with the hands and carried forward so as to obliterate the suprasternal and diaphragmatic flexures and allowed to fall with the

cæcum on the right of the body, as far forward as possible, so as to be out of the way of the operator. The operator, standing on the right of the

FIG. 4.—Horse, showing Recto-duodenal Ligament. *a*, Ligature around rectum; *b*, ligature around duodenum.

animal, should now pull out the small intestines, allowing them to fall over the platform, attached by the mesentery (see Fig. 3, *b*). The mesenteric arteries should then be examined by manipulation to determine the presence or absence of Ane-

urisms of these vessels, usually verominous. He should then go to the left side of the animal, and, beginning near the anus, pull out the rectum and floating colon on that side (see Fig. 4). *The recto-duodenal ligament will now be exposed to view, and this indicates the situation where ligatures are to be applied to the intestine.* One ligature is placed around the rectum near the corresponding extremity of this ligament (at *a*, in Fig. 4). Another ligature, *b*, is passed around the duodenum just at the beginning of the jejunum; *i. e.*, at the insertion of the above named ligament. The gut is cut through at this point, and the *jejunum and ileum are dissected from the mesentery*, and, after being ligatured at the cæcum, cut through (*b*. in Fig. 5), and allowed to fall to the floor or into a receptacle placed there. The operator now *excises the rectum*, as near to the anus as possible, and dissects forward until he comes to the ligature (*a*, Fig. 5), where he cuts the gut through and allows it to fall.

The next procedure is to free the *cæcum*, *double colon*, and what remains of the *floating colon* from their attachments. This is easily done by detaching the loose cellular tissue with the fingers and by cutting the strong bands of peritoneum, the meso-cæcal ligaments—by which the cæcum is attached to the sublumbar region and to the colon at its origin—and

the cellular tissue which attaches the double colon to the pancreas and to the wall of the abdomen. The attachments having been severed, the cæcum and colon are allowed to fall to the floor.

Now that the intestines have been removed, it is better to open the *thorax* and remove the organs, as this cavity should be examined before the liver is removed. If it is attempted to remove the liver first, there is danger of wounding the diaphragm, and there is also a dissagreeable escape of blood from the severed vessels. Moreover if the organs in the thorax have been removed, the diaphragm may be freed from its attachments to the ribs, and, together with the liver, may be allowed to fall forward into the thoracic cavity, thus giving more room to work at the other organs.

Before opening the thorax the pectoral muscles should be divided, care being taken not to wound the main blood vessels in the axilla. The cords attaching the fore legs to the iron bars may then be loosened, allowing the legs to fall outward, and giving the operator a chance to make a larger opening into the chest. This having been done, the muscle remaining attached to the sternum should be removed, and the ribs sawn through far enough from the sternum on either side to afford sufficient room to examine the thoracic cavity and to remove the

organs (see Fig. 6). The ribs having been sawn through, the diaphragm should be freed from its attachments to the sternum, the intercostal muscles

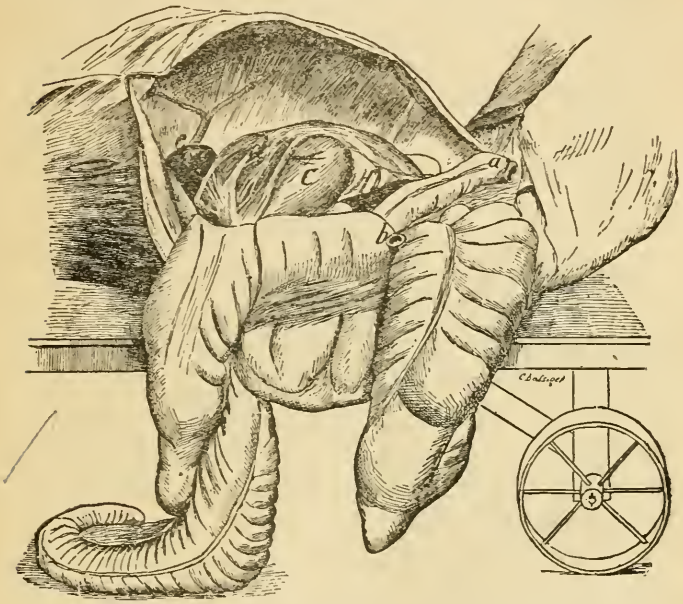

FIG. 5.—Abdominal Viscera of the Horse. *a*, Rectum, and *b*, ileum, ligatured and excised; *c*, stomach; *d*, spleen; *e*, liver; *f*, pancreas.

divided, and the tissues over the pericardium dissected as close to the sternum as possible. The sternum having been removed, any abnormal contents of the pleural cavity must be noted. Adhesions should be sought for. The pericardium is then

to be opened, beginning the incision at the base of this sac and extending it far enough to see whether there is any fluid present or not. If there is fluid present, it should be measured as accurately as possible. The incision is to be extended toward the base of the heart as far as possible, and any abnormal condition of the epicardium and pericardium should be noted.

The *heart* is now to be examined. Make: 1. An incision into the right auricle from the anterior vena cava to the auriculo-ventricular sulcus, and remove and examine the blood in the right auricle.

2. Make an incision along the right border of the right ventricle (or of the heart), beginning just below the auriculo-ventricular sulcus and continuing to the apex of the right ventricle. The auriculo-ventricular sulcus is therefore left intact between the two incisions. Remove and examine the blood in the ventricle.

3. Make an incision in the left auricle, beginning between the pulmonary veins and continuing to the auriculo-ventricular sulcus. Remove and examine the blood in the left auricle.

4. Make an incision along the left border of the heart, beginning below the left auriculo-ventricular sulcus and continuing to the apex. Remove and examine the blood in the left ventricle.

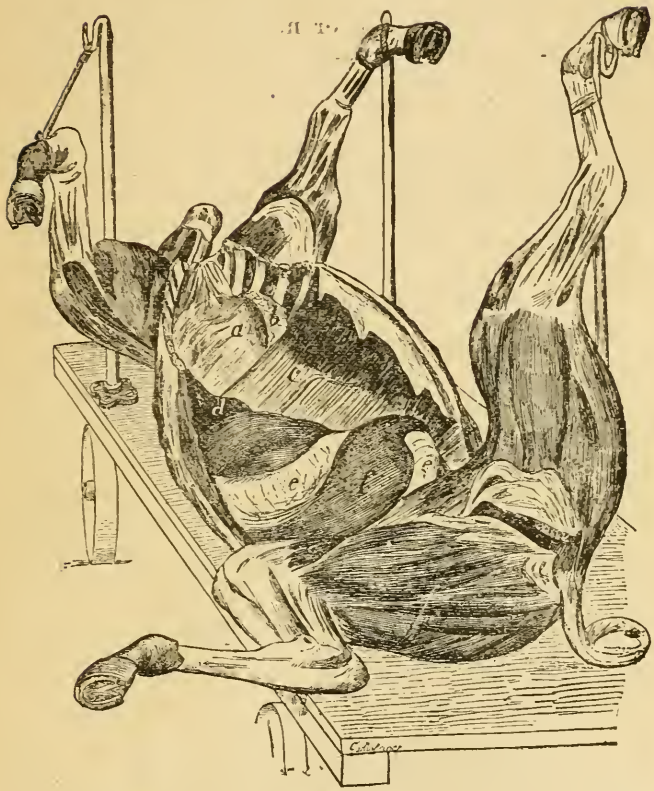

FIG. 6.—*a*. Heart; *b*, lung; *c*, diaphragm; *d*, liver; *e*, stomach; *f*, spleen.

5. Insert the thumb and fingers into the incisions so as to grasp the heart firmly by the septum near the apex, and by broad sweeps of the knife cut the veins, arteries, etc., so as to remove the heart from the chest, dividing the vessels at a good distance from the heart.

6. Make an incision close to, and parallel with the septum, into the right ventricle on its anterior surface, the incision extending from the apex, where it meets a previous incision, into the pulmonary artery. Examine the pulmonary valves and the parts exposed.

7. Connect the incision along the right border of the heart with that in the right auricle, by dividing the intervening part of the auriculo-ventricular sulcus. This exposes the tricuspid valve.

8. Make an incision on the anterior surface, close to and parallel with the septum, into the left ventricle, the incision extending from the apex, where it meets a previous incision, into the aorta. This incision exposes the aortic valves and the interior of the left ventricle.

9. Connect the incision along the left border of the heart with that in the left auricle, by dividing the intervening part of the auriculo-ventricular sulcus. This incision exposes the mitral valve. The incisions into the ventricles make, therefore, triangular flaps.

Perhaps a simpler method of examining the heart is that recommended by Dr. Johnston of Montreal, Canada, in his "Syllabus of Post Mortem Methods." This method applies to the heart after it has been removed from the chest without having made any incisions in the organ *in situ*. The organ in the larger animals is so bulky, however, as to require great care not to cut the vessels so near the heart as to wound the valves, if this method be employed. It is as follows:

The heart having been removed from the body, any abnormality in general appearance must be noted; also the condition of the epicardium and the size of the organ. *Open and examine the cavities of the heart*, following the order of the circulation—right auricle; right ventricle; left auricle; left ventricle. The incisions are best made with the large probe-pointed scissors used for opening the intestines.

"I. Open the right auricle by cutting from the superior to the inferior vena cava."

"II. Pass the probe-pointed scissors down the pulmonary artery and into the right ventricle and open it by an incision, passing between the segments of the pulmonary valve and extended to the apex, keeping just to the right of the septum. Examine carefully the cavity of the ventricle and the valves before proceeding further."

"III. Pass the probe-pointed blade of the scissors through the tricuspid orifice, and cut across the face of the tricuspid valve, extending the incision to the apex of the right ventricle, along the right border of the heart."

The left chambers are examined in a corresponding manner.

"IV. Slit open the left auricle where the pulmonary veins enter."

"V. Pass the scissors down the aorta into the left ventricle, drawing the pulmonary artery over to the right so as not to wound it, and cut behind it along the left side of the septum as far as the apex. As one of the aortic cusps lies directly in the track of this incision it is difficult to avoid injuring it. Examine the interior of the ventricle and the valves before making the next incision."

"VI. Make an incision from the left auricle to the apex of the left ventricle, passing the probe-pointed blade of the scissors through the mitral orifice, and cutting along the left border of the heart."

In a medium sized horse the larger axis of the heart is about $10\frac{1}{4}$ inches; its antero-posterio diameter, measured near the base, is equivalent to $7\frac{1}{2}$ inches; its lateral diameter does not exceed from 5 to $5\frac{1}{2}$ inches. The average weight is about $6\frac{3}{4}$ lbs. The pericardium should now be removed from the

thorax, and the bronchial lymphatic glands examined *in situ*, so far as possible.

After cutting through the trachea at its bifurcation, each *lung* must be removed separately. The pulmonary and costal plurae must be examined. The lung must be pressed upon to see whether it crepitates or not. Several incisions should then be made lengthwise in the organ, in order to determine whether there are areas of consolidation or other abnormalities. The lungs of the horse are so large that one is likely to overlook a small patch of pneumonia, unless many sections are made. The bronchi should be laid open, and the presence of mucous or other abnormalities noted. The pulmonary vessels can also be dissected out.

The contents of the thorax having been examined, we now return to the *abdomen*. It will be remembered that we have left *in situ* the liver, spleen, stomach, duodenum, pancreas, kidneys, suprarenal capsules, and the genito-urinary apparatus, together with the great blood vessels and the mesentery.

The *diaphragm* should be cut down on either side close to the ribs so as to allow the liver to fall over into the thoracic cavity.

The *spleen* should now be removed. It lies close to the side of the stomach. Its normal weight in the horse is about thirty-two ounces. It is attached by

the suspensory ligament to the anterior border of the left kidney and to the sublumbar wall, and by the gastro-splenic omentum to the greater curvature of the stomach. The anterior extremity is thicker than the posterior, and is channelled by a slight longitudinal fissure which lodges the splenic vessels and nerves.

The spleen having been removed and excised, the next procedure is to dissect away the loose fold of omentum attached to the stomach. This shows the *pancreas* in its relation with the stomach and kidneys.

The pancreas weighs about seventeen ounces and is somewhat triangular in shape; it lies behind the liver and stomach, in front of the aorta and posterior vena cava, and has an opening—the pancreatic ring—for the passage of the portal vein. Its principal excretory duct, the duct of Wirsung, leaves the organ by two or three branches which soon unite, and the main trunk enters the ductus choledochus. The accessary pancreatic duct opens into the duodenum opposite the duct of Wirsung.

The *duodenum* should now be opened, starting on the side corresponding to the mesenteric attachment, then cutting across to the other side before the opening of the bile-duct is reached, and continuing the incision to the stomach. The bile-duct should now

be examined to see whether it is pervious or not.

The attachments of the pancreas, which are chiefly loose cellular tissue, may now be broken down with the finger, the ducts and vessels cut across, and the pancreas removed and examined.

The duodenum and *stomach* may now be removed from the body. The incision along the duodenum should be continued along the greater curvature of the stomach to the œsophagus, the contents of the stomach removed and the walls examined.

The stomach of the horse, though classified as simple, is nevertheless divided into two parts, between which there is an abrupt line of separation. The left half is pale in color and the epithelial lining is of the pavement variety, being a direct continuation of that lining the œsophagus. The right half of the stomach is the true digestive part; the lining is very red, and the epithelium is of the columnar variety. What are termed bots—*i. e.*, the larvæ of the Œstrus equi—are often seen in the stomach and by many are supposed to be a very common cause of disease. They are not believed by veterinarians, however, to be of any consequence in this regard.

The *kidneys* should be removed next. They are situated on either side of the vertebral column, in the right and left lumbar regions, the right kidney

being a little more anterior than the left. These organs, in the horse, have essentially the same shape as in man. The right is heavier in horses, its weight being about twenty-seven ounces, while the left weighs twenty-five ounces. This is exactly the opposite of what is seen in man, in whom the left kidney is larger and heavier than the right.

The kidneys having been removed from the body, they should be laid upon the table or a support of some sort, in order to make a proper section. To do this, place the palm of the left hand upon the organ, then with a large, flat-bladed knife, held in the right hand, cut along the convex border, at the same time turning the kidney with the left hand toward the knife. The section should be continued through the organ into the pelvis of the kidney. See if the capsule is of normal thickness and easily removed. When we examine the cut surface of the kidney it will be seen that the arrangement differs somewhat from that seen in man, in that in the horse there is no division into separate pyramids, the striæ starting from every part of its exterior and converging toward the common pyramid.

The *suprarenal capsules*, which can be removed either now or in connection with the kidneys, are two in number, and placed on the median border and

anterior extremity of each kidney. They are flattened, and measure about two and one-half inches in length by one and one-half inch in breadth, the right being somewhat larger than the left, corresponding to the difference in size of the kidneys.

Before removing the organs in the *pelvic cavity* it is necessary to saw through the symphysis pubis (as shown in Figs. 3 and 5); then, by loosening the cords attaching the hind legs to the iron rods, the pubic bones will separate, leaving an opening large enough for the operator to insert his hand. The organs may then be removed *en masse* and dissected outside the body.

The *liver* in a medium-sized horse weighs about eleven pounds. It has three lobes: the right; with a small appendix, the lobus Spigelii; the left, which is largest; and the middle lobe, which is divided into several lobules. This organ must be removed by dividing the ligaments which attach it to the diaphragm (or it may be conveniently removed in connection with the diaphragm), and then dividing the blood vessels which enter it. It may be noted that there is *no gall-bladder* in the horse, the flow of bile into the duodenum being constant. The liver having been removed, the capsule covering it should be examined; then the substance of the organ may be exposed by many cuts in different directions.

Next remove the *diaphragm* (if not previously taken out with the liver), then the mesentery, and, finally, the large blood vessels. It remains now to open the *intestines*; or, if preferred, they may remain until everything else is finished. The small intestine is to be opened, as in human autopsies, by an incision running the whole length at the mesenteric attachment. The same rule applies to the large intestine, with the exception of the double colon, which is opened along the outer margin of the double coil.

We next proceed to examine the *neck* and *head*. In examining the neck it must be noted that in horses what are known as the *guttural pouches* exist. These pouches are dilatations of the Eustachian tubes; they are two in number, one on either side, and extend from the inferior face of the atlas to the anterior part of the pharynx. The capacity of each is about three-fourths of a pint; but, in consequence of the extensibility of the mucous membrane, this is very variable. The pouches are situated immediately beneath the parotid glands and sometimes become filled with pus and press upon the larynx, interfering with respiration. The *thyroid gland* is composed of two oval lobes situated immediately behind the larynx, beside the first two rings of the trachea. These lobes appear to be independent, but close examination shows them to be united by an inter-

mediate portion, the isthmus, which passes across the anterior face of the trachea. They should be excised and removed.

The *parotid glands* should next be removed and the *guttural pouches* laid open.

The *tongue*, *larynx*, *trachea*, *pharynx*, *œsophagus*, and *submaxillary glands* should be removed *en masse*. Before doing this, however, *Stenson's duct* should be examined, as it is sometimes the seat of calculi. To remove the tongue, cut the muscular attachments extending from the tongue to the lower jaw; then divide the articulation of the hyoid bone at the styloid cornua. This is easily done by inserting the hand along the side of the tongue and feeling for the flat styloid bone, which extends along the side of the tongue for the posterior two-thirds. By placing a knife against the inner surface of this bone and cutting toward oneself the knife will pass through the articulation without any trouble. Disarticulation having been accomplished, the knife should be placed close to the inner surface of the submaxillary bone; then, cutting toward the pharynx, divide the muscular attachments. As soon as the muscular attachments are divided far enough to admit of it, take hold of the tip of the tongue and pull it through the submaxillary space. The mass can thereby be lifted and the cutting will be much more easily done.

The section should be made deep enough to include the soft palate with the pharynx, and the incisions may now be carried backward close to the vertebral column so as to remove the larynx, trachea, and œsophagus in connection with the tongue and pharynx. The *œsophagus* and *pharynx* are to be opened, and then the *larynx* and *trachea*.

The *submaxillary lymphatic glands* must be examined and any enlargement noted. If the enlargement be circumscribed and hard, glanders may be suspected. If, on the other hand, there is general swelling of the glands under the jaw with œdema of the connective tissue, and especially if the animal be young, the condition known as strangles may be present.

We now come to the *cranial cavity*. This cavity must be opened with the least possible injury to the brain itself and to the cranial bones. To take out an animal's brain, the head must be disarticulated from the body. This is done at the atlo-occipital articulation. A long-bladed knife is necessary. It is better to place a block under the pole or the point of the occiput. This will cause the head to point forward, and tend to make tense the muscles. The soft parts are then cut through, and the joint-ligaments severed. Place the head on the table, resting on the lower jaw, and dissect off the temporal muscles. With a saw make a transverse cut through

the frontal and parietal bones, on a line about two inches above the upper border of the orbital cavity

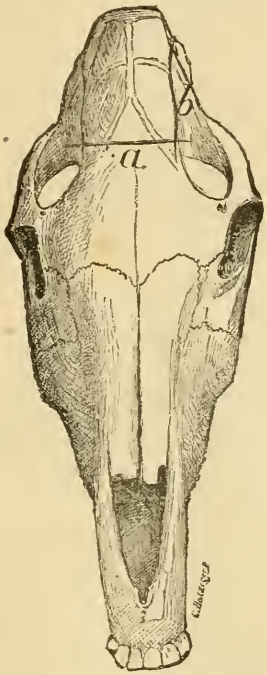

FIG. 7.—Skull of Horse, showing the Lines of Incision for Removal of the Skull-cap. Superior view.

(*a*, in Figs. 7, 8 and 9). Lines drawn from each end of this transverse cut to the lower border of the upper third of the occipital foramen will indicate the position in which the longitudinal cuts are to be

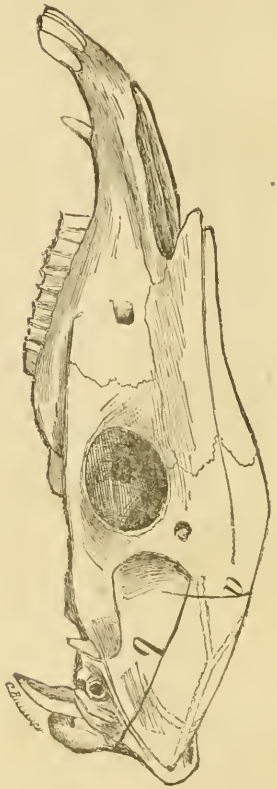

FIG. 8—Skull of Horse, showing the Lines of Incision for Removal of the Skull cap. Lateral view

made (*b*, in Figs. 7, 8 and 9). Care must be used in making these longitudinal cuts not to saw too deeply over the parietal portion, as the bone here is only one-eighth to one-fourth of an inch in thickness, while at the occiput it is about one inch thick.

Having, therefore, sawn carefully until, by want of resistance, we know that the parietal bones have been penetrated, we must change the angle of the

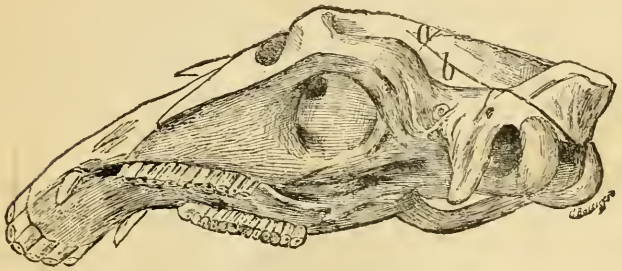

FIG. 9—Skull of Horse, showing the Lines of Incision for Removal of the Skull-cap. Infero-lateral view.

saw so as to go through the occipital bone. We can then, by using a little judgment, make a continuous cut without injury to the brain. Any pieces of bone not sawn through must be broken with the chisel. Complete section of the skull-cap having been made, the anterior part must be lifted up, the dura mater cut through—if it is adherent, which is generally the case especially in old horses—and the cap pulled

back. In horses there is a bony plate which separates the cerebrum from the cerebellum—the tentorium cerebelli,—so that care must be used not to

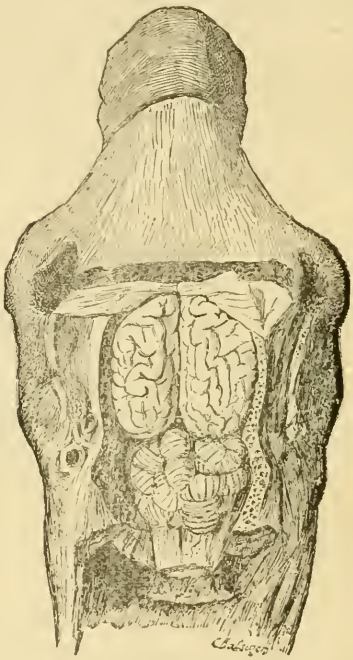

Fig. 10—Head of Horse with Skull-cap Removed.

injure the brain on this projection when pulling the skull-cap off.

The *skull-cap* having been removed (see Fig. 10), it should be examined for any alteration in structure

on the inner surface; also as to any thickening of the dura mater. The general condition of the surface of the *brain* must be examined. The dura mater, if it has not been taken off with the skull-cap, must now be divided longitudinally and transversely. The head must be made to rest upon its base so that the brain will tend to fall backward. Insert the third and fourth fingers of the left hand under the anterior part and gently raise the brain; divide the *olfactory lobes* as far forward as possible. These lobes are greatly developed in horses, and are hollow, communicating directly with the lateral ventricles, differing in this respect from the human olfactory lobes.

These lobes having been divided, the *nerves at the base* of the brain must be severed while drawing the brain backward. This having been completed, the brain is easily removed from the cavity.

After removal, a general inspection of the brain is to be made. The average weight of a horse's brain is from twenty-two to twenty-three ounces. When it is being removed from the cavity the condition of the blood-vessels at the base will be noticed; also whether there are any adhesions between the membranes or not. For making the primary section of a brain, it is well to use a sharp knife with a thin, wide blade.

After removal, the vessels and the pia-arachnoid membrane may be still further examined. The brain is now placed upon its base, the cerebral hemispheres drawn apart so as to expose the corpus callosum. An incision is made on each side, at the junction of the corpus callosum and the convolutions, into the lateral ventricle, which is to be laid open along its whole extent. Note the amount and character of fluid in the ventricles, and the presence or absence of tumors in the choroid plexus. One or more longitudinal incisions can now be made in an oblique direction outward into the medullary substance of the hemispheres nearly to the cortex. After dividing the fornix, a series of transverse sections is to be made from before backward through the corpus striatum and optic thalamus, so as to expose all parts of the basal ganglia and the internal capsule. A longitudinal incision is to be made through the middle lobe of the cerebellum down to the fourth ventricle. From the fourth ventricle a median incision, dividing the roof of this ventricle and that of the aqueduct of Sylvius, is carried into the third ventricle. After replacing the parts, as nearly as possible in their normal positions, the brain is turned so as to rest on its convexity, and the pia mater is detached from the interpeduncular space and from the pons and medulla oblongata. A series

of transverse incisions should now be made through the crura cerebri, the pons and the medulla oblongata. This completes the dissection of the brain.

The lower jaw must now be removed. It remains to expose the *frontal and nasal sinuses* by dividing the head vertically in the antero-posterior plane. The condition of the mucous membrane of the nasal cavities and of the sinuses must be noted.

The *spinal canal* may be examined in sections of about two feet in length and the cord may be removed either by sawing through the laminæ of the vertebræ and removing the section thus made, or by sawing obliquely through the bodies of the vertebræ from below, on either side, being guided in the incision by the articulation of ribs, and removing the included piece of bone. By the latter method a much thicker piece of bone has to be sawn through, but there is the advantage of having less muscle to remove. Before attempting to take out the cord, the fore legs, with the scapula, must be removed from the body, the ribs and muscles divided about six inches from the vertebræ on either side, and the vertebral column sawn through just in front of the pelvis. The sections are then to be made and the cord removed by either of the before-mentioned methods. The removal of the cord is a tedious process and one seldom necessary.

It now remains to examine the *extremities.* This can usually be done by general inspection, unless some especial dissection is required.

The points to be noticed are the condition of the hoofs, especially in the foreleg: First, as to the shape of the sole, whether it is normal or concave, or whether it is less concave than normal—a condition known as flat-foot—or whether it is convex, a condition which is the result of inflamation with consequent separation of the horn from the sensitive parts beneath. Any abrasions of the surface must be noted. The wall must be examined and any cracks or seams, especially at the toe or on the quarters, noted; as must also be the presence of irregular rings which come close together in front. Any loss of substance, with suppuration of the parts beneath, should be noted. Next, any enlargement and hardening of the lateral cartilage, to be felt just above the coronary band on either side, are to be noted; then any exostosis at or near the articulation of the os coronæ and os suffraginis; then any oxostosis between the large and small metacarpal bones; finally, any alteration above this part.

In the hind leg, in addition to the above, especial attention should be given to the hock and stifle. The hock, as is well known, is often the seat of an exostosis with, sooner or later, anchylosis, designated

as a spavin. At the back of the hock there is also oftentimes a prominence known as a curb, being a thickening of the calcaneo-cuboid ligament.

If it is considered necessary to examine the foot in

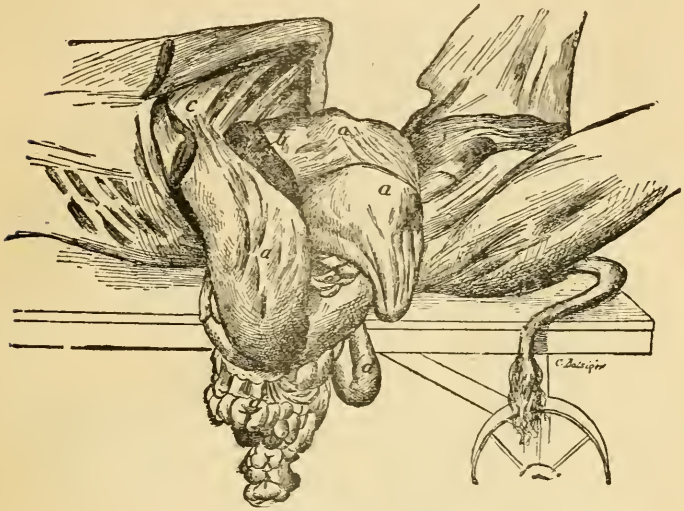

FIG. 11.—Cow; with Abdomen Opened. *a*, Stomachs; *b*, spleen; *c*, diaphragm; *d*, intestines.

particular, the hoof must be removed, an operation which is rather difficult to perform. The leg should be sawn through just below the fetlock, placed in a vice, and sections of the hoof made in front and through the sole and, if necessary, over the quarters. The horn must then be loosened at the top by dividing it from the coronary band. Then with the

blacksmith's tongs the horn can usually be torn from the sensitive parts beneath.

DIFFERENCES OF PROCEDURE IN ANIMALS OTHER THAN THE HORSE.—In *cattle*, while the intestines are

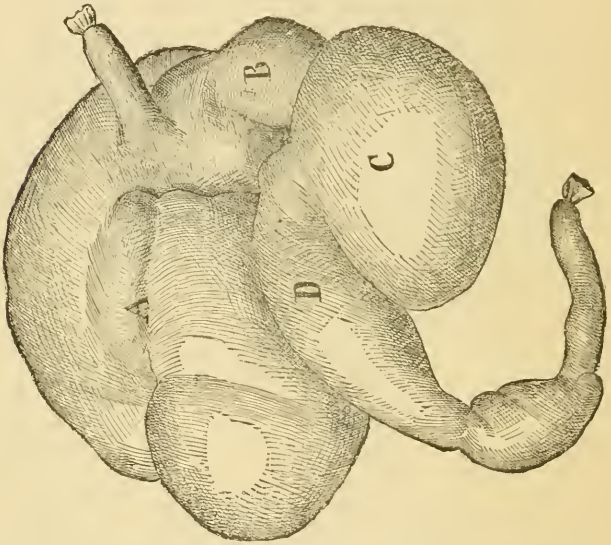

FIG. 12.—Stomachs of a Cow. A, rumen; B, reticulum; C, omasum; D, abomasum.

less bulky than those of the horse, the stomachs are far more voluminous and occupy most of the abdominal cavity. It is best, therefore, to *remove the stomachs* (together with the spleen) *first* (see Fig. 10). This is best done by dividing the œsophagus, pulling

the stomachs out as much as possible from the cavity, freeing the attachments to the wall, and then dividing the duodenum and allowing the mass to fall to the floor.

The stomachs in ruminants (see Fig. 11) are generally spoken of as four in number—the *rumen*, *reticulum*, *omasum*, and *abomasum*. The abomasum, however, is the only one which has digestive functions. The rumen, the first of the stomachs, occupies three-fourths of the abdominal cavity. Incomplete septa divide the cavity into two sacs, the right and the left. The mucous surface is covered with papillary prolongations. It has two openings, both situated in the left sac; one leads to the œsophagus, the other to the reticulum or second stomach. An incision made in the rumen at the entrance of the œsophagus is carried forward to the end of the cavity, and a continuation of the incision posteriorly along the lesser curvature of the reticulum opens the œsophageal groove and enters the omasum and the posterior part of the reticulum. An incision through the floor of the œsophageal groove and through the roof of the second stomach upon which this groove lies continues the opening of the reticulum. The omasum and abomasum can be opened by an incision carried along the greater curvature of these stomachs.

The *pancreas* in cattle lies in a fold of the mesentery, and its duct, which is single, empties into the intestine from fourteen to sixteen inches beyond the ductus choledochus. It is better, therefore, after opening the duodenum and examining the common bile-duct, to *remove the intestines together with the mesentery and including the pancreas.* The intestines having been removed, the pancreas should be freed from its attachments and excised. The mesentery should then be dissected off and the intestines opened at the place corresponding to the mesenteric attachment. The arrangement of the intestine is much simpler in cattle than in the horse. The cæcum is without bulges or longitudinal bands; one extremity is rounded and floats freely in the abdominal cavity, while the other is continuous with the colon. There is no division of the colon into the large or double colon and the small or floating colon; but a greater part of it is turned upon itself in such a way as to make several spiral convolutions, continuing from the last convolution in a straight line to the rectum.

The procedure for opening the *thorax* is exactly like that followed in the horse.

The *brain* is removed somewhat differently; the frontal bone is greatly developed at the expense of the parietal and occipital. The frontal sinuses are

enormously developed in cattle (see Fig. 14.) The horns must be sawn off at the base. A transverse cut should be made through the skull about one and

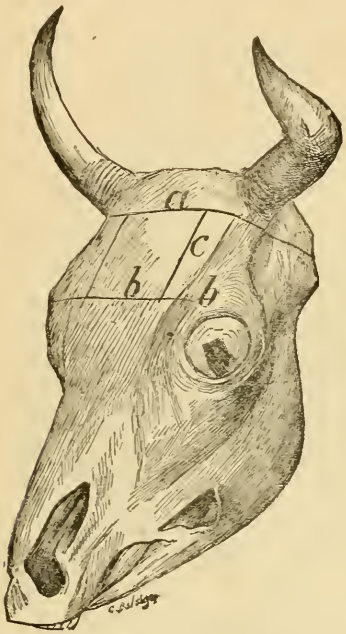

FIG. 13.—Lines of Incision Necessary for Removal of the Skull cap in Cattle.

one-half inch in front of the crest situated between the horns, and the cut be continued in an oblique direction backward and downward so as to terminate at the occipital foramen (line *a*, Fig. 13). Care should

be taken to avoid injuring the brain. After removing the bone separated by this incision, the posterior part of the cerebrum and all of the superior surface of the cerebellum and pons varolii, with the medulla

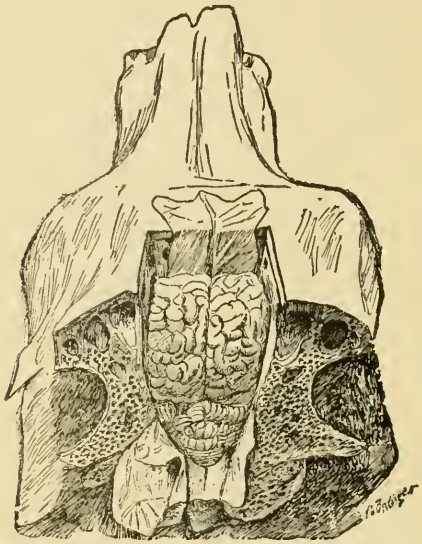

Fig. 11.—Head of Ruminant with Skull-cap removed.

oblongata, will be exposed. A second transverse cut (*b*, Fig. 13) should now be made in a line about one-half inch above the eyes. This will enter the cranial cavity at the anterior extremity of the brain. Two longitudinal cuts (*c*, Fig. 13) must now be made, one on either side, at about one and one-half inch from

the median line. The incisions thus made will be completed with the hammer and chisel and the plate of bone lifted off (see Fig. 14). The brain will then be removed as in the horse.

The directions laid down for post-mortem examinations of cattle will apply to other ruminants.

In *dogs*, *pigs*, *cats*, *rabbits*, *etc.*, the *brain* is removed as in the horse. In all of these animals the other organs may be removed in the same order as in man.

In the *pig* the arrangement of the intestine bears some resemblance to that of the ox. The coils of the colon throughout the greater part of their length are intimately adherent, and require much care in dissecting them apart.

In *carnivora* the intestines are very short. The small intestine, suspended at the extremity of a mesentery similar to that of solipeds, rests on the inferior abdominal wall. The cæcum forms only a small, spirally twisted appendix. The colon is scarcely larger than the small intestine, and is neither sacculated nor furnished with longitudinal bands. In its short course it is disposed much like the same intestine in man; and, as in him, may be divided into the ascending, transverse, and descending colon, which is continuous with the rectum.

FIELD-AUTOPSIES.—What has thus far been written in this article concerning autopsy methods is upon

the assumption that the operator has suitable arrangements at his disposal. In the field no such conveniences are at hand, and the operator has to get along as best he can. Very often, moreover, as the time at his disposal will not allow him to make a thorough examination of all parts of the animal, he must take the clinical history into account as to which organ he may wish to examine and adopt methods in accordance therewith. If, for instance, the animal died from intestinal trouble, the main part, and probably all, of his observations will be confined to the abdominal cavity. It is very much better in this case to have the animal upon its back. This can generally be done if a stake such as butchers use can be found, with an iron point at each end; one end can be struck into the wall of the thorax while the other is pushed into the floor or ground. If this cannot be obtained, blocks or fence-rails will answer the purpose fairly well. They must be placed on either side of the body as far underneath as possible. The pectoral muscles should then be divided and the four legs allowed to lie out straight upon the ground. The adductors of the thigh will then be cut across, allowing the hind legs to fall outward. The incisions in the thorax and abdomen will then be made and the organs removed as directed above.

Sometimes circumstances will not allow the oper-

ator to place the animal upon its back, in which case the animal should be allowed to lie upon its right side, the fore and the hind legs of the left side removed and as much of the abdom as possible cut

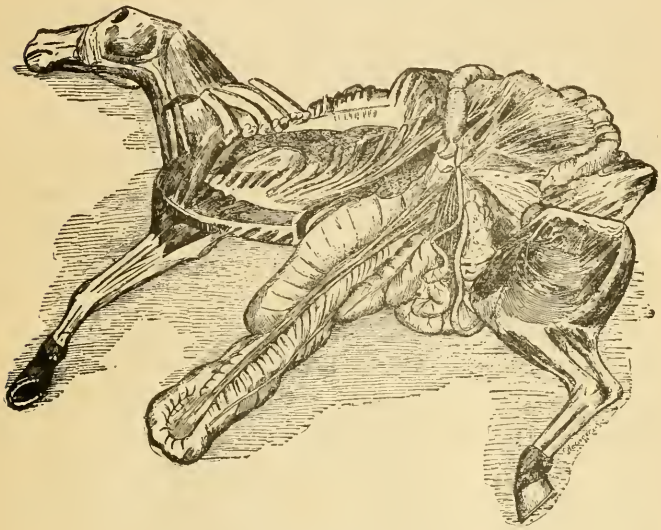

Fig. 15.—Field-autopsy on a Horse.

away (see Fig. 15). The double colon should then be straightened out and carried forward. The small intestine must be pulled out as far as possible, thereby putting the ligaments which attach it to the vertebræ upon the stretch. The rectum should be pulled out and allowed to fall over the back and

hip (see Fig. 15). The recto-duodenal ligament will then be exposed, together with the upper part of the liver, the spleen, stomach, pancreas, one kidney, and the organs in the pelvic cavity.

The intestines must be removed first, as in the ordinary manner. The thoracic wall on the upper side can be removed by dividing the ribs near the sternum, cutting the intercostal muscles from the sternum to the vertebræ., and forcing each rib upward and then backward, thereby loosening the costo-vertebral articulations (see Fig. 15). The organs in the thorax and those remaining in the abdomen can now be removed and examined in the usual way.

If the animal died of pulmonary disease, and it is desired to see the thoracic organs only, the operation is comparatively simple. The fore leg should be removed, and the intercostal muscles divided the whole length of the ribs; the ribs are then divided with the costatome or saw, near the sternum. Each rib is then removed separately, as directed above.

The heart and lungs can be removed together, or the top lung may be first removed at its base, then the pericardium opened and the heart-incisions made, and the organ removed. The lower lung may then be removed, and with it the bronchial lymph-glands. For the smaller animals no especial modification is

necessary. The modifications here described should never be used unless the circumstances are such that this method is unavoidable. It is too common a practice among veterinarians to depend upon the clinical history in determining just how far it is necesssary to carry the post-mortem examination. It is always better to complete the examination, even if it has to be done roughly. Were all autopsies made for the sole purpose of verifying the ante-mortem diagnosis very little advance in pathology would be made.

Records of Autopsies.—The results of the post-mortem examinations should be recorded. When it is possible, it is best to dictate to an assistant the description of the various appearances as the autopsy proceeds. When this is not practicable, the protocol of the autopsy should be written as soon as possible after completing the examination, while the results are fresh in one's mind.

The description of the post-mortem appearances should be objective. It is not sufficient simply to say that such or such disease is found, but the changes in consistence, color, size, and shape, which the diseased part presents should be objectively described.

The appearance of each organ examined, whether it is diseased or not, should be noted in the proto-

col.

The following protocols of autopsies recently made by the writer are introduced to illustrate the method of recording post-mortem examinations. These autopsies are also of considerable interest in themselves.

CASE 1. *Horse: Rupture of the Stomach and of the Diaphragm; Chronic Peritonitis; Alveolar Sarcoma of the Peritoneum.*—The subject is a gray gelding, about twenty years of age; weight, about one thousand and fifty pounds; in good condition; abdomen somewhat distended. There are no abrasions of the skin, save slight ones made by the friction of the harness. There is a swelling on each hind leg over the os suffraginis.

The mucous membrane of the nostrils is of a purplish color; that of the mouth and eyes, rather pale.

In the middle of the neck there is a slight thickening of the skin over the jugular vein on the left side. Upon removal of the skin a distinct dilatation of the vein, about the size of the end of a man's thumb, is seen. The wall of the vessel here is much thinner than that of the adjoining part of the vein.

The swelling in the hind legs is found to be of a bony nature, but the joint is not involved.

The abdomen having been opened by the longitudinal and transverse incisions and the flaps laid

back, the exposed peritoneum, especially the part covering the diaphragm and that extending back over the inferior wall, is found to be covered with a thin layer of connective tissue, which is detached with difficulty and leaves a ragged surface. The cavity contains a large amount of bloody fluid. Near the extremity of the cæcum, covering an area about the size of the surface of a man's two hands, is a layer of connective tissue, which is removed with difficulty and leaves a ragged surface. A little nearer the extremity of the cæcum is a tumor six inches long by four inches in width and three inches in thickness, uniformly white in color and lobulated in appearance. This mass is firmly attached to the cæcum and to the diaphragm by new tissue. Otherwise, the layer of peritoneum covering the intestine is smooth and glistening.

The colon having been straightened out and, with the cæcum, allowed to fall out of the cavity, the small intestine is seen to be in part protruding through a hole in the diaphragm into the thoracic cavity. The intestines having been placed in position for dissection, the rupture in the diaphragm is seen to be about eight inches in length, extending transversely through the muscle and situated in the epigastric and left hypochondriac regions. The edges of the rupture are quite smooth. The spleen

is partly pushed through this hole, as is also a part of the stomach. On inserting the hand into the pleural cavity through the rent in the diaphragm, this cavity is found to contain a large amount of bloody fluid mixed with partially digested food.

The intestines having been removed and opened the mucous membrane is seen to have a slightly yellowish tint.

On opening the thorax the pleural cavity is found to contain at least eight to ten gallons of blood-colored fluid mixed with a large quantity of partially digested food. The lungs are retracted so as to expose nearly the whole of the pericardium. There are no adhesions to be felt. The surface of the pericardium is smooth and glistening, as is also that of the epicardium, but beneath the latter are many points of ecchymoses on either side of the anterior ventricular groove.

The heart having been removed and dissected, the endocardium is found to be smooth and glistening; the heart-muscle reddish brown in appearance, and firm.

The costal and pulmonary pleuræ are smooth and glistening; the lungs, light pink in color. On passing the hand over the surface of the lungs, solid nodules can be distinctly felt in the interior of the lung substance, which are, on an average, about the

size of a pea. These nodules are few in number and scattered; otherwise the lungs crepitate throughout. On section most of these nodules have a yellowish-white appearance, with a small, opaque, apparently caseous centre. The rest of the section shows the lung-substance of normal pink color. The large bronchial tubes contain a considerable amount of mucus.

The spleen, together with the fold of omentum covering the stomach, having been removed, it is examined and found to be of normal size, the capsule smooth and glistening, the substance on section dark red. The diaphragm is now cut away from its attachment to the ribs, so as to allow it, with the liver, to fall forward into the thoracic cavity. A rupture about six inches long is seen along the greater curvature of the stomach. The cavity of the stomach is nearly empty, and the rupture is seen to be confined to the pyloric or true digestive portion. The edges of the rent are smooth, and the wall is scarcely more than one-eighth of an inch thick. On removing and opening the stomach and duodenum, the mucous membrane is normal in appearance.

The suprarenal capsules are studded on their surface with hard yellowish masses, on an average about the size of the head of a pin. These little masses are yellowish throughout and do not project

much into the substance of the organ. There are none of these masses in the interior of the capsules.

The capsule covering the kidneys is smooth and glistening, and easily removed from the substance of the kidney. On section the striæ are distinct; the cortex, of normal thickness and color.

The liver is of normal appearance. The capsule is smooth and glistening, and the substance, as seen through the capsule, dark brown, while on section the surface exposed presents a lighter brown appearance and the lobules are distinct.

There is a verminous aneurism, the size of an English walnut, of the anterior mesenteric artery. The aneurismal sac is filled with a firm reddish-gray clot containing numerous strongyles. The muscular tissue of the wall of the artery on the central side is hypertrophied so that it measures one-quarter of an inch in the thickest part.

The dura mater is firmly adherent to the skull; the pia mater, smooth and glistening. The substance of the brain is firm and of a faint yellow color. On section the gray and white matter are of normal appearance.

The spinal cord was not examined.

The nasal mucous membrane is free from ulcerations and presents no abnormalities, except a cyan-

otic hue.

Microscopic Examination.—The nodules in the lungs show, on section, a centre of cells which have undergone coagulation-necrosis and which do not stain, while around the edge of this necrotic centre is a mass of lymphoid cells which stain well. Around this area of lymphoid cells is a portion where the lung-substance is completely replaced by connective tissue. Around the nodules is an area where the air-cells are completely or partially filled with epithelial cells and fibrine.

The tumor which is described above shows, on microscopic examination, a basement of connective tissue rich in cells enclosing alveoli in which are contained some spindle-shaped and many round cells. Cells similar to those in the alveoli are also found scattered in the stroma (alveolar sarcoma).

The nodules on the surface of the suprarenal capsules show, on examination of that organ, a structure identical with that of the rest of the organ, from which they are separated by a band of connective tissue. They are therefore partially detached portions of the gland.

The clinical history of this case, as far as it could be obtained, is as follows: The horse began to show symptoms of sickness about 11 A. M. He stopped frequently and tried to lie down. The owner finally

got him home and put him in a field. Here the horse rolled about a good deal. The owner went to dinner, and when he returned the horse was dead. It was two o'clock in the afternoon when the horse arrived at the knackery, and, happening to be there at the time, I made the autopsy immediately.

From the short duration of the illness, taken together with the age of the horse and the apparent atrophy of the wall of the stomach, together with the bloody appearance of the fluid in the abdomen and, in consequence of the rent in the diaphragm, in the pleural cavity also, I am led to believe that the rupture in the stomach was ante-mortem, causing death by shock.

CASE 11. *Horse: Chronic Glanders.*—This animal, a bay gelding in poor condition, of about one thousand pounds weight and about fifteen years of age, was destroyed for the above disease. He was killed by bleeding.

The external lesions are as follows: There is a thick muco-purulent discharge from both nostrils; the mucous membrane of the nostrils is pale where it is not ulcerated. On both sides of the septum nasi is a large red patch covering nearly all that can be seen of the septum. The mucous membrane is ulcerated over this area and is ragged at the edges. There is considerable loss of substance, ap-

parently, of the cartilage, as evidenced by the depression on the surface. There are several smaller ulcers to be seen in the nostril, and a few tubercles, which are raised from the surface, red on the edge, and yellowish white in the centre.

The submaxillary glands are enlarged, hard, not adherent to the bone. On the left side of the neck, at about the lower third, is an enlargement about the size of a pea, movable with the skin, but which does not discharge pus when squeezed. Similar nodules are scattered over the body, some of which discharge a thick yellow pus on squeezing them, while others have already ruptured, leaving ulcers.

Upon removal of the skin, the glands in the axilla and in the inguinal region on the left side are seen to be enlarged; those in the axilla considerably, those in the inguinal region less so.

The peritoneal cavity contains about one quart of amber-colored fluid; the peritoneum is smooth and glistening The intestine, as seen *in situ*, is of normal steel-gray color. The lymphatic glands in the mesentery are enlarged, some of them to the size of a walnut; the larger ones are soft.

There are no adhesions to be felt between the pleuræ.

The pericardial sac contains about a teacupful of clear, straw-colored fluid. The pericardium is

smooth and glistening, as are also the epicardium and the endocardium. The heart-muscle on section shows a light-brown color, and is firm.

The lower third of the left lung is solid, and on section shows hepatized parenchyma of uniform dark-red color, with considerable interlobular exudation near the pleura. The pleura is smooth and glistening over the whole of both lungs. Throughout both lungs, other than the portion which is uniformly solidified, are hard nodules, varying in size from the head of pin to a pea, which can be distinctly felt on passing the hand over the lungs. On section some of these nodules show a red edge with a yellowish-white centre—in some cases caseous, in others calcareous; others of these nodules are red throughout. Most of them shell out easily. Those which are broken down in the centre have a smooth wall. The harder ones shell out *en masse.*

The spleen is greatly enlarged, measuring ten inches in its widest part, twenty-four inches in length, and in places three inches in thickness. The capsule is smooth and glistening. On section the spleen-pulp is of dark-red color and normal consistence. The Malpighian corpuscles are plainly visible. There is apparently considerable increase of the connective tissue

There are a few nodules the size of a pin-head on

the surface of the left suprarenal capsule, and more on the surface of the right suprarenal capsule. These nodules are yellowish in color and firm. They do not project far into the capsule, which is of normal dark-brown color in the cortex and of yellow color in the medullary portion.

The kidneys are firm. The capsule covering them is smooth and glistening. On section the cortical striation is coarse; the glomeruli are very plainly visible.

The capsule covering the liver is smooth and glistening. The substance of the liver shows, on section, normal brown color. There are three small, opaque white nodules in the interior of the organ, which are calcareous in the centre.

The bladder is normal.

There is a verminous aneurism, the size of a hen's egg, of the anterior mesenteric artery. The aneurismal sac is nearly filled with a moist reddish clot containing numerous strongyles.

The brain is of firm consistency. The dura mater is firmly adherent to the skull. The pia mater is smooth and glistening. On section the brain-substance shows the gray and white matter normal in appearance.

The mucous membrane of both nostrils is pretty well covered with ulcers and tubercles. This con-

dition extends as far back as the larynx.

CASE III. *Cow: Acute Contagious Pleuro-pneumonia.*—An Alderney cow, six years of age, of about seven hundred pounds weight, in fair condition, died with symptoms of the above disease. The autopsy was made six hours after death.

There are no external lesions. The visible mucous membranes are pale; the abdomen is slightly distended. The peritoneum covering the walls of the abdominal cavity is smooth and glistening, as is also that covering the stomach and intestines. The capsule covering the spleen is smooth and glistening. This organ has its normal gray appearance, as seen through the capsule. On section it is firm and of normal brown-red color.

The stomachs are of normal color, and on section the mucous membrane is found to be normal.

The pleural cavity of the right side contains two or three gallons of clear serum mixed with flakes of lymph. There are no adhesions, but the pleura of the right side is covered with fresh exudation.

The pericardial sac contains about a teacupful of clear fluid. The inner surface of the pericardium and the epicardium are smooth and glistening. The heart-muscle is reddish brown in color. The endocardium is smooth and glistening.

The exudate covering the pleura of the right lung

is about one inch in thickness, and is mixed with serum.

The right lung, throughout nearly its whole extent, is solid, greatly increased in size, and weighs forty-five pounds. On section clear serum follows the knife. The hepatized parenchyma varies in color from a very bright red to almost a black. The interlobular tissue is filled in most places with coagulated lymph, giving it a white appearance. In places, especially near the base of the lung, the interlobular substance is quite firm, giving it the appearance of increased connective tissue. In this area there is also an increased amount of grayish connective tissue around the bronchus in the centre of each lobule. The blood-vessels, in the region where the consolidated lung is blackish red, are plugged. The bronchial mucous membrane in the larger bronchi is clear.

There is considerable yellowish-white exudate in the superior mediastinum, surrounding the large blood-vessels, the œsophagus, and the lymphatic glands.

The mediastinal lymphatic glands are enlarged, œdematous, and on section show small yellowish-white opaque areas, having an appearance similar to the exudate in the interlobular tissue.

The left lung is normal, and weighs six pounds.

The pancreas is of normal size and consistence, and pale yellow in color.

The intestines are of normal color, and the mucous membrane is normal.

The suprarenal capsules are of normal size and consistence, brown in color, and on section brown in the cortex and yellow in the medullary portion.

The kidneys are firm and of normal size, and the capsule is smooth and easily pulled off. On section the striæ are a little cloudy in appearance.

The bladder is of normal size and color. It is about half-full of clear, amber-colored urine.